Inhibitory effects of an aqueous extract of Clitoria ternatea flower on α-glucosidase during in-vitro wheat starch digestion

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Inhibitory effects of an aqueous extract of *Clitoria ternatea* flower on α-glucosidase during *in-vitro* wheat starch digestion. By C. Ronald, B.S. Chu, *Division of Food and Drink, School of Applied Sciences, Abertay University, Bell Street, Dundee, DD1 1HG*

Phenolic compounds in plants inhibit α-glucosidase, reducing carbohydrate absorption and contributing to anti-diabetic activity[1], particularly anthocyanins from coloured fruit and vegetables such as berries[2] and black and purple carrots[3]. The aim of this study was to evaluate inhibition behaviours of an extract from the blue *C. ternatea* flower against α-glucosidase during *in-vitro* wheat starch digestion i.e. the potential of the flower extract to modulate starch digestion in a bid to reduce postprandial hyperglycaemic response.

Inhibition of an aqueous extract of dried *C. ternatea* flowers, at different concentrations, against α-glucosidase was determined according to the method of Sui *et al.*[4] with minor modifications. In Eppendorf tubes, at each extract concentration, aliquots were mixed with the extract, 0.5 mg/mL α-glucosidase, 40 mg/L calcium chloride, and distilled water to 712 µL, then incubated at 37ºC for 15 min for the enzyme to interact with the extract. Aliquots were made up to a 750 µL reaction solution with 1 mg/mL gelatinised starch solution and incubated at 37ºC for 5 min to simulate starch digestion. Exactly 100 µL 3,5-dinitrosalicylic acid reagent solution was added to each tube, heated for 10 min in boiling water, then cooled for 10 min in an ice bath; glucose concentration was then measured. Experiments were repeated with *C. ternatea* extract at 3 mg/mL and differing starch concentrations; 0.5-2 mg/mL. All experiments were repeated in triplicate.

Results showed decreases in glucose liberated and increases in %inhibition, after 5 min digestion, as concentrations of *C. ternatea* extract increased. Around 80% inhibition was reached at 5 mg/mL *C. ternatea* extract. Significant statistical differences ($p<0.001$) were found between the means of *C. ternatea* extract groups as determined by one-way ANOVA. Tukey post hoc tests showed that mean glucose liberated between each concentration was statistically significantly lower as concentration increased ($p<0.05$), except between concentrations 3 and 4 mg/mL, where the difference found was not statistically significant ($p=0.421$). Inhibition activity of *C. ternatea* extract against α-glucosidase was found to be uncompetitive with K_M = 2.309 mg/mL, V_{MAX} = 0.346 mgmin^{-1} and IC_{50} = 2.315 mg/mL.

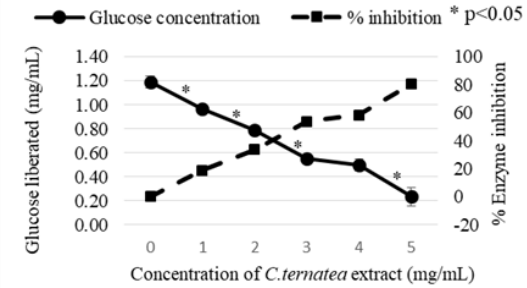

Fig. 1. Effect of *C.ternatea* extract on % inhibition of α-glucosidase.

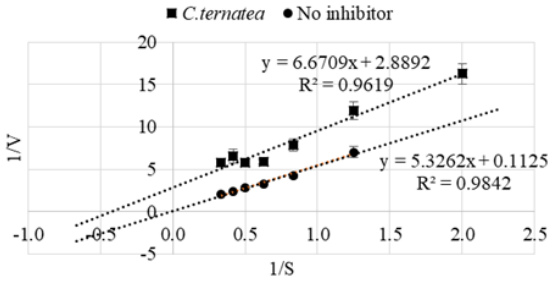

Fig. 2. Lineweaver-Burk plot; with and without *C.ternatea* extract to assess type of inhibition against α-glucosidase.

These results suggest that *C. ternatea* extract has potential to be utilised to prepare functional foods and/or nutraceuticals to help control postprandial hyperglycaemic response therefore, could be used to treat, and reduce the risk of developing, Type 2 diabetes.

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2. Castro-Acosta M, Lenihan-Geels G, Corpe CP *et al.* (2016) *P NUTR SOC* 75, 342-355
3. Esatbeyoglu T, Rodríguez-Werner M, Schlösser A *et al.* (2016) *J Agric Food Chem* 64, 5901
4. Sui X, Zhang Y, Zhou W (2016) *J Funct Foods* 21, 50- 57